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MICRONUTRIENTS

VITAMINS,
MINERALS
& MORE

VITAMIN B
PART TWO
B9,B6,B7,B12

DR PAUL APPROVED-VOLUME 3

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Check Vitamin Levels At Home:
https://trylgc.com/paulthomasvitamin

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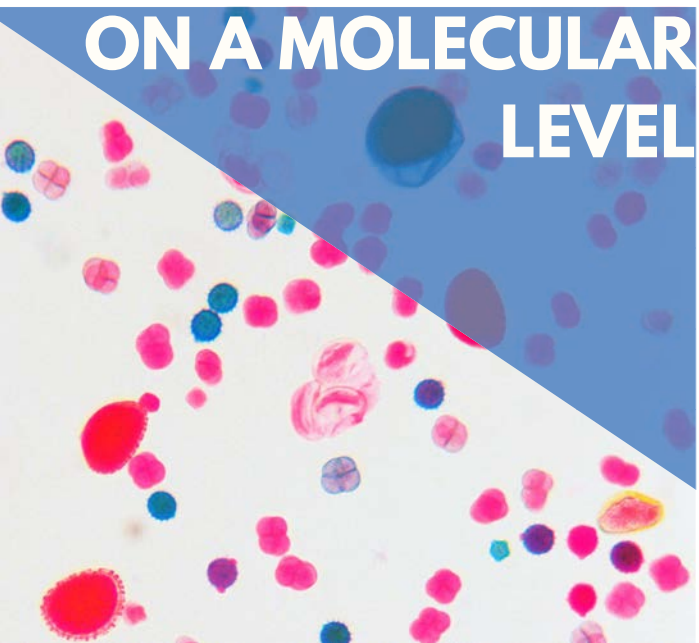
VITAMIN B9

Folic Acid

WHY IS IT IMPORTANT?

Folate in it's biologically active form, is either 5-methyl-tetrahydrofolate or tetrahydrofolate. Methylation of RNA and DNA is not only essential for the normal growth and development of the unborn child's brain and body, but for everyone's ongoing health and cancer prevention.

ON A MOLECULAR LEVEL



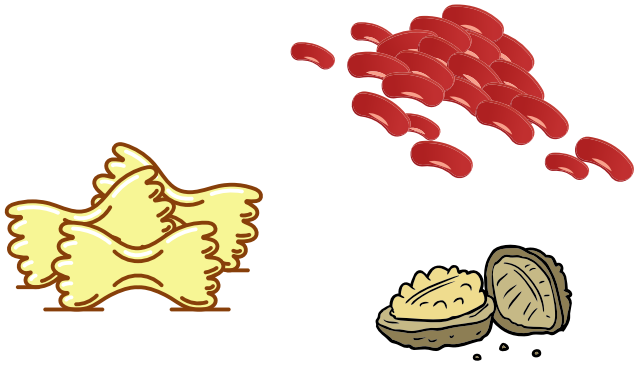
In conjunction with vitamin B12 it donates the methyl group to homocysteine to make it methionine. This is the key step in the methylation cycle, needed to produce methyl groups needed for the formation of all proteins and enzymes, the production of neurotransmitters and it helps remove excessive homocysteine and is vital in one carbon metabolism of nucleic acids and amino acids.

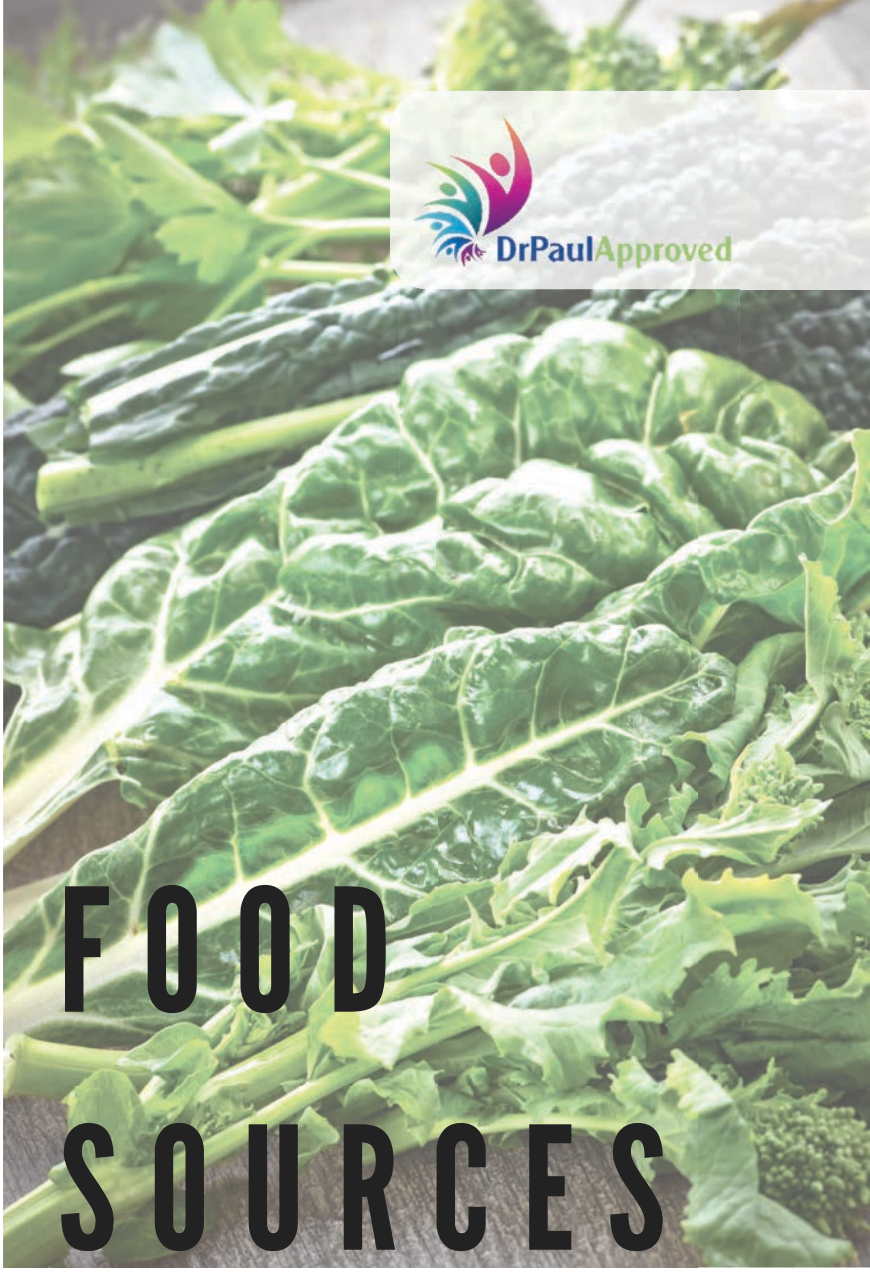
SYMPTOMS OF DEFICIENCY

The initial evidence of folate deficiency can be seen in the blood where anemia develops with larger red blood cells (RBC's), and as this progresses you may have fatigue, weakness and shortness of breath. Other generalized symptoms associated with low folate may include

- -anorexia
- -constipation
- -neurological issues like headaches, insomnia, memory impairment, paranoia or restless legs.

Major concerns when there is low folate during pregnancy has to do with the babies brain development. Neural tube defects can result in lack of brain development (anencephaly) or spin bifida. Heart defects and limb malformations are also reported . The high homocysteine associated with low folate is associated with cardiovascular diseases like stroke, arteriosclerosis and heart attacks. Folate with it's methylation support also promotes improved removal of toxins and reduces cancer risk and risk of Alzheimer's and dementia.





The best food sources are green leafy vegetables, legumes (beans and lentils), and it is added to breakfast cereals and white rice and pasta. Nuts, seeds, wheat germ, liver and nutritional supplements also provide folate.

There is an important point with folate supplementation and B12 status. If you exceed 1 gram (1000 micrograms) of folate daily this can cause a B12 deficiency with serious neurological issues. It is rare to see this at folic acid doses under 5 grams (5000 micrograms) and if you supplement B12 when you supplement folic acid this will avoid this issue.

I strongly recommend you choose to supplement methyl-folate rather than folic acid or plain folate.

SAFETY AND TOXICITY

RDA (Recommended Daily Allowance)

TOLERABLE UPPER LIMITS

Infants not determined (I would recommend 200 micrograms a day)
Children 400 - 800 micrograms
Teens/adults 1000 micrograms

Unless your diet is high in folate foods, or you have micronutrient testing showing your levels are adequate, consider adding this at 400 - 1000 micrograms a day along with methyl-B12. Always take methy-folate in your prenatal vitamin even if your diet seems adequate.

There is no toxicity if your intake is food based. If you are supplementing extra folate, be aware that large doses (above 1 - 5 grams) can mask the detection of the megaloblastic anemia of B12 deficiency and allow a B12 deficiency to progress undetected. Supplementing methyl-B12 will also avoid this issue.

ALWAYS SUPPLEMENT WITH METHYL-FOLATE. FOLINIC ACID IS ALSO FINE.

http://lpi.oregonstate.edu/infocenter/vitamins/fa/

VITAMIN B6
PYRIDOXINE

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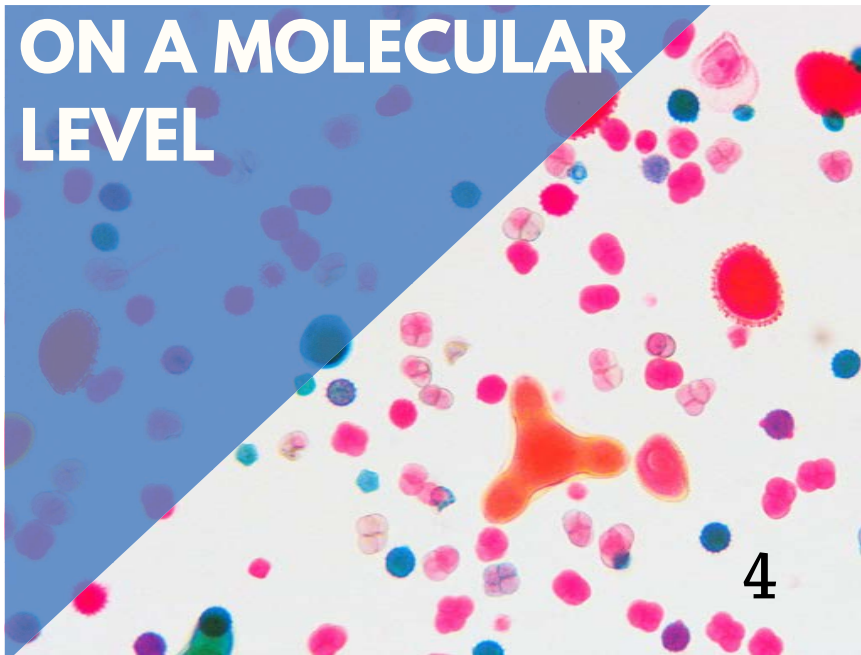
WHY IS IT IMPORTANT?

Vitamin B 6 comes in several forms:
- pyridoxal
- pyridoxine
- pyridoxamine (and add a -5-phosphate molecule to the above three).

Vitamin B6 is known to benefit immune function and cognitive function (depression, anxiety, autism, ADHD and more).

Humans cannot make this vitamin so it is an essential nutrient that must come from the diet. The pyridoxal-5-phosphate (P5P) form of B6 is involved in about 100 enzyme reactions including:

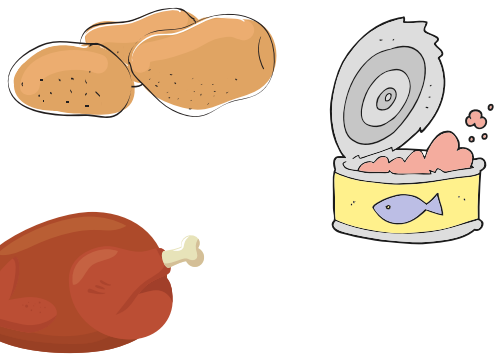
- Releasing glucose stored in glycogen by glycogen phosphorylase
- Creating glucose from amino acids in gluconeogenesis
- Creating neurotransmitters dopamine, norepinephrine, serotonin and gamma-aminobutryric acid
- Formation of heme in red blood cells
- Formation of the vitamin niacin from tryptophan
- Formation of nucleic acids (DNA and RNA) conversion of homocysteine to cysteine and
- Hence glutathione for proper immune system and detox functions.



SYMPTOMS OF DEFICIENCY

I would recommend one consider this nutrient for any neurological condition (seizures, impaired brain function, irritability and confusion, autism, ADHD etc.) or psychiatric (anxiety, depression, depersonalization etc.). There were reports of seizures in infants fed formula that was without this nutrient in the 1950's. Alcoholics with poor nutrition are at risk for this deficiency. Because of the importance in the methylation cycle and the reaction taking homocysteine to cysteine and thus glutathione, deficiency could lead to:

- Cardiovascular (heart attacks, atherosclerosis and strokes)
- Impaired brain function
- Decreased immune system(B6 needed for lymphocyte production and interleukin-2)



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FOOD SOURCES

Food Source	mg B6
Chickpeas (1 cup)	1.1
Beef liver (3 oz)	0.9
Tuna (3 oz)	0.9
Potato w/skin	0.7
Banana	0.7
Salmon (3oz)	0.5
Fortified cereals	0.5
Turkey/chicken	0.4
Spinach (1cup)	0.3
Hazelnuts (1oz)	0.2
Other nuts (1oz)	0.1

SAFETY AND TOXICITY

This is a water soluble B- vitamin which can only be toxic at high doses of vitamin supplements exceeding 500 - 1000 mg a day.

Sensory neuropathy (pain or numbness in arms or legs and difficulty walking) have been reported.

RDA (Recommended Daily Allowance)

TOLERABLE UPPER LIMITS

	Mg/day
infants	unknown
children	30 - 60
teens and adults	100

If you are taking the following medications, these can interfere with B6 such that you should consider taking higher doses; isoniazid, cycloserine, penicillamine, levodopa. High doses of vitamin B6 should be avoided if you are on phenobarbitol, phenytoin and levodopa.

Vitamin B6 may be taken as either pyridoxine HCl or P5P (pyridoxal-5-phosphate). The P5P form may be more effective although there is some benefit from taking both forms. Because vitamin B6 requires riboflavin, magnesium and zinc in it's metabolic pathways, it would be best that this is taken along with a multivitamin that has at least the RDA (recommended daily allowance) of these other nutrients.

VITAMIN B7

BIOTIN

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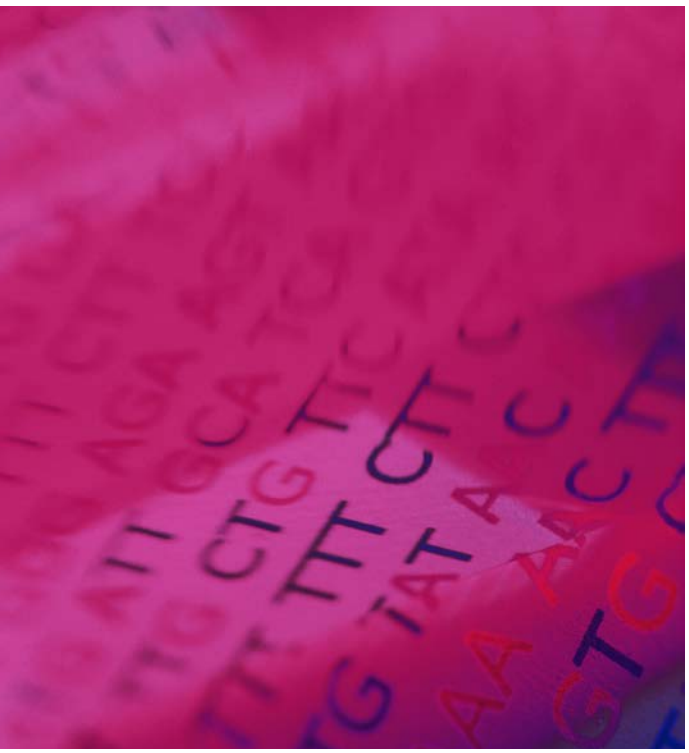


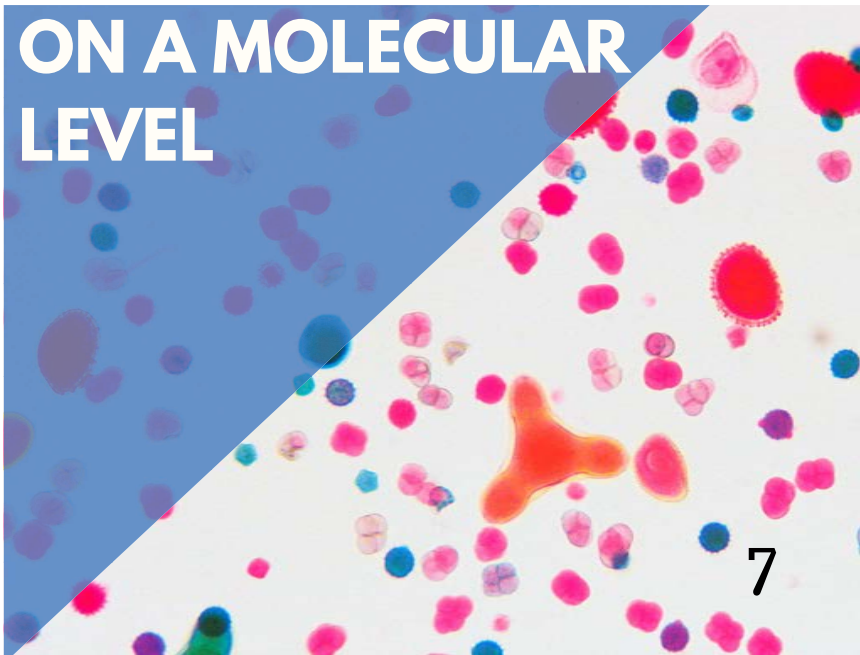
WHY IS IT IMPORTANT?

Through biotinylation, biotin is thought to play a role in replication and transcription of DNA and RNA.

Biotin, (Vitamin B7) has also referred to as Vitamin H or coenzyme R, has it's main function as a cofactor for carboxylase enzymes:

- Acetyl-coenzyme A (CoA) carboxylase needed to make fatty acids
- Pyruvate carboxylase - needed to make glucose from amino acids and fats
- Methylcrotonyl-CoA carboxylase - needed to make the essential amino acid leucine
- Propionyl-CoA carboxylase - needed for many steps in metabolism of amino acids, cholesterol and fatty acids.

ON A MOLECULAR LEVEL



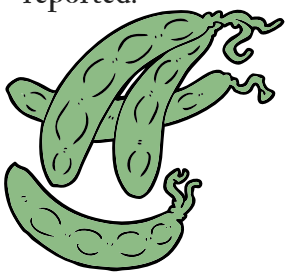
SYMPTOMS OF DEFICIENCY

Deficiency is very rare, typically limited to the rare hereditary disorders of biotinidase deficiency and holocarboxylase synthetase deficiency.

Those with these deficiencies may require supplementation in the range of 5 mg to 100 mg respectively. The bacteria in our colon are thought to make enough biotin to meet the needs for most of us.

Symptoms seen most often with biotin deficiency are

- Hair loss
- Red rash around the eyes, nose, mouth and genital area.
- Neurological symptoms of depression, lethargy, hallucinations and numbness and tingling of the extremities have been reported.



Liver, eggs, yeast and wheat bran have the highest amounts of biotin (14 -27 micrograms per serving). . Legumes, whole grains, fish, avocado, and raw cauliflower have 4 - 6 micrograms per serving.

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FOOD SOURCES

SAFETY AND TOXICITY

There is no known toxicity with biotin and doses up to 200 mg a day have been used for those with the heredity conditions listed above without problems. Those on long term seizure medications or sulfa medications may need extra biotin.

RDA (Recommended Daily Allowance)

Adequate biotin doses are 5 - 10 micrograms for infants, 10 - 20 micrograms for children and 30 - 60 micrograms for adults. Non-insulin dependent adults taking 9 mg daily have been shown to have a 45% reduction in fasting blood glucose.

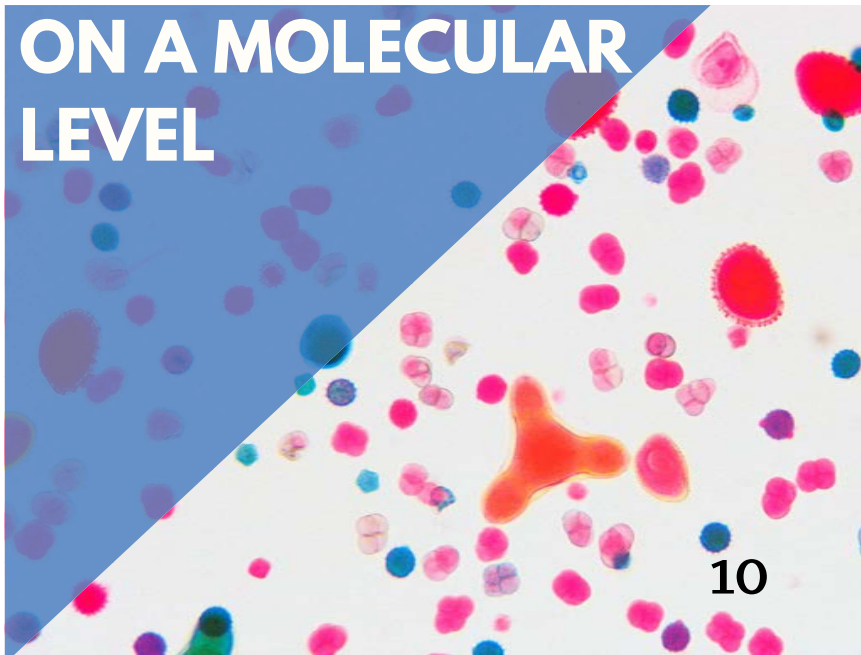
http://www.ncbi.nlm.nih.gov/pubmed/16772434
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2726758/

WHY IS IT IMPORTANT?

Methyl-B12 is required for the function of methionine synthase which donates the methyl-group from methyl-B12 converting homocysteine to methionine. This is usually the rate limiting step the vital methylation cycle, that also requires methyl-folate (hence the recommendation to also take methyl-folate (+/- folinic acid) when supplementing B12. SAMe (S-adenosylmethionine is the key methyl-group donor needed for the formation of neurotransmitters, and for methylation of DNA and RNA. This is also important in the production of energy from fats and proteins and the synthesis of hemoglobin.

Vitamin B12 is the only vitamin with the metal ion cobalt, hence it's name cobalamin. The active forms in the body are methyl-B12 and 5-adenosyl cobalamin (B12). The cyanocobalamin used in most supplements usually is easily converted to these active forms, however many Integrative medicine physicians (myself included) prefer to give ample B12 in the form of methyl-B12.

Getting B12 from food into the blood stream and then into the cells of our body is a complex process involving adequate stomach acid, R-proteins, enzymes and intrinsic factor along with calcium. Only 1% of dietary B12 is absorbed when there is a breakdown in any of these steps.



SYMPTOMS OF DEFICIENCY

Pernicious anemia, thought to affect 2 - 10% of adults over 60, is an auto-immune destruction of the stomach lining which prevents the formation of the intrinsic factor-B12 complex thus preventing absorption of B12. Those who have decreased stomach acid (either due to age, use of antacids, H pylori infection, surgical removal of part of the stomach) and those on strict vegan diets are particularly at risk for B12 deficiency.

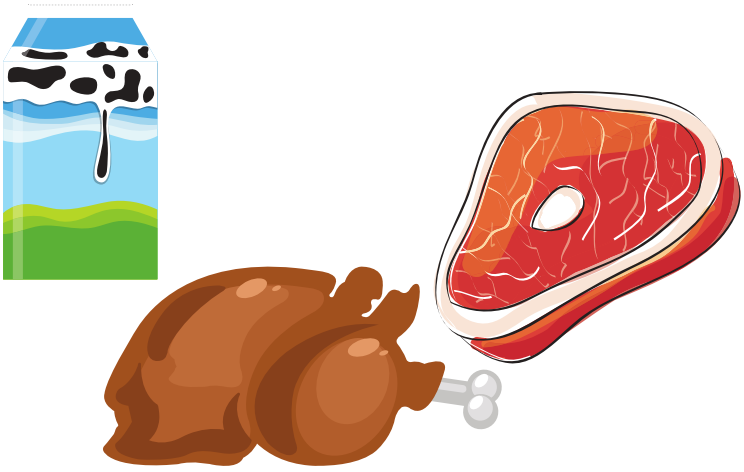
Symptoms are typically related to anemia or neurological, however given the importance of B12 for methylation, deficiency will also put you at greater risk for heart disease and cancers. The earliest way to detect a B12 deficiency is to measure an elevated homocysteine (indirect evidence of impaired methylation) or measure elevated Methylmalonic Acid (MMA) due to impaired methylmalonyl-CoA. A blood B12 level may only reflect the short term recent B12 in the diet. Functional testing (www.spectracell.com) can also give a good indication of how much B12 is making it into the cells over the previous several months.

- Anemia: Low B12 impairs methionine synthase thus preventing the regeneration of tetrahydrofolate and trapping folate in the unusable form. This is another reason for supplementing methyl-folate along with methyl-B12. With anemia comes shortness of breath, fatigue , weakness, irritability and a sore tongue, decreased appetite and constipation.

- Neurological: Initial symptoms include numbness and tingling of the arms and legs, difficulty walking and memory loss, disorientation and mood issues or dementia. Ataxia and a loss of position sense may be the first signs and degeneration of the nerves and spinal cord can follow and be permanent if left untreated. There are studies showing increased Alzheimer's when B12 is low.

RDA (Recommended Daily Allowance)

There are no reports of toxicity, even when long term intake of 1000 micrograms (1 gram) daily orally or monthly by injection. Injections are generally not necessary unless one has pernicious anemia or an absorption issue.



Bacteria can synthesize B12 and B12 is highest in animal products including fish, meats, poultry and shellfish, being highest in muscles and clams (20 - 84 micrograms per 3 ounces). Poultry, eggs and dairy tends to have about 0.3 - 1.0 micrograms per serving.

Since many are not absorbing well, passive diffusion of 1% means a 1000 micrograms (1 gram) in the diet would result in 10 micrograms entering the blood stream. Recommended daily allowance (RDA) is 0.5 micrograms for infants and 3 micrograms for adults, pregnancy and lactation. These levels are clearly inadequate for most and I recommend at least 100 micrograms even for infants or children and often will give 500 - 1000 micrograms daily for those known to be deficient.

FOOD SOURCES

http://www.ncbi.nlm.nih.gov/pubmed/24667752
http://www.ncbi.nlm.nih.gov/pubmed/23356638
https://www.youtube.com/watch?v=8JVJKBwDCd8

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DR. PAUL'S SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul
to get 25% discount)

B Complex Liquid (Children)

Stress B-Complex 60 cap

OR

Active B Complex

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.

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DR. PAUL'S TARGETED SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul
to get 25% discount)

P5P50 (activated B-6)

B-12/ methyl folate 100 vegcaps

B-Complex Plus 120 vegcaps

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.

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DR. PAUL'S TARGETED SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul
to get 25% discount)

Active chewable B12 w/L- Methylfolate

B Complex Liquid

B12 Liquid 30ml

B12- active cherry

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.